

AperTO - Archivio Istituzionale Open Access dell'Università di Torino

## Compressibility and high-pressure behaviour of lead feldspar.

**This is a pre print version of the following article:**

*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/1567033> since 2016-06-16T15:40:25Z

*Publisher:*

G. Croce

*Terms of use:*

Open Access

Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.

(Article begins on next page)

## 6P5. Compressibility and high-pressure behaviour of lead feldspar

Nadia Curetti, Piera Benna, Emiliano Bruno

*Dipartimento di Scienze della Terra, Via Valperga Caluso 35, I-10125 Torino, Italy: [piera.benna@unito.it](mailto:piera.benna@unito.it)  
CrisDi Interdepartmental Center for Crystallography, Via P. Giuria 5, I-10125 Torino, Italy.*

High-pressure *in situ* X-ray diffraction was performed on synthetic lead feldspar. The crystals, with composition  $\text{PbAl}_2\text{Si}_2\text{O}_8$ , were synthesized from melt as in a previous work and thermally treated at  $T = 1150^\circ\text{C}$  for 12 h and further annealed at  $T = 1000^\circ\text{C}$  for 70 h [1]. A single crystal of lead feldspar was preliminary characterized by using a Gemini R Ultra X-ray diffractometer (CrisDi, University of Torino). At room condition the unit-cell parameters are  $a = 8.3936(4)$ ,  $b = 13.0498(7)$ ,  $c = 14.3258(8)$  Å,  $\beta = 115.281(6)^\circ$ ,  $V = 1418.9(1)$  Å<sup>3</sup>; space group:  $I2/c$ ;  $Q_{\text{od}} = 0.7$ .

The sample was loaded in an ETH-type diamond anvil cell (DAC) and the unit-cell parameters were measured in the  $P$  range 0.0001 - 8.4 GPa at room  $T$ , using a Siemens P4 diffractometer and SINGLE software [2]. The evolution with pressure of the unit-cell parameters and volume shows a strong discontinuity between 7.7 and 8.2 GPa indicating a first order-phase transition. In the  $P$  range 0.0001 - 7.7 GPa the trend shown by the axial compressibility ( $\alpha_a > \alpha_c > \alpha_b$ ) is similar to that observed in the previous HP powder diffraction study, performed on lead feldspar using high-brilliance synchrotron radiation up to 7.1 GPa [3].

In the  $P$  range 0.0001 - 4.3 GPa at room  $T$ , the  $P$ - $V$  data of the  $I2/c$  lead feldspar were fitted with a 2nd-order Birch-Murnaghan EoS, using EosFit7c software [4]. The parameters obtained are:  $V_0 = 1422.2(1)$  Å<sup>3</sup> and  $K_{T0} = 76.4(9)$  GPa. At  $P > 4.27$  GPa, the volume values deflect from the BM2 curve and show a volume softening, precursor of the reported HP phase transition. Also in strontium feldspar a volume softening was recently observed above 4.2 GPa [5].

Another crystal of lead feldspar of the same synthesis was loaded in the DAC to investigate the structural changes with increasing pressure. Single-crystal diffraction intensities were collected with Gemini diffractometer at  $P = 0.0001, 2.4, 3.1, 5.4, 6.0, 7.2, 8.4, 9.7$  GPa. The measurements up to 7.2 GPa showed only  $a$  ( $h+k = \text{even}, l = \text{even}$ ) and  $b$ -type ( $h+k = \text{odd}, l = \text{odd}$ ) reflections ( $I2/c$  space group). The appearance of  $c$  ( $h+k = \text{even}, l = \text{odd}$ ) and  $d$ -type ( $h+k = \text{odd}, l = \text{even}$ ) reflections at  $P = 8.4$ , the analysis of the systematic absence and the structural refinements indicate that the HP first-order transformation is an  $I2/c - P2_1/c$  phase transition.

[1] P. Benna, M. Tribaudino, E. Bruno *Am. Mineral.* **1996**, 81, 1337.

[2] R.J. Angel, L.W. Finger *J. Appl. Cryst.* **2011**, 44, 247.

[3] M. Tribaudino, P. Benna, E. Bruno, M. Hanfland *Phys. Chem. Minerals.* **1999**, 26, 367.

[4] R.J. Angel, J. Gonzalez-Platas, M. Alvaro Z. *Kristallog.* **2014**, 229, 405.

[5] F. Pandolfo, T. Boffa Ballaran, F. Nestola, M. Koch Muller, M. Mrosko, E. Bruno *Am. Mineral.* **2011**, 96, 1182.